TWO NEW GENERA OF NEMATODES, WITH A NOTE ON A NEGLECTED NEMATODE STRUCTURE.

By Maurice C. Hall,

Senior Zoologist, United States Bureau of Animal Industry.

In this paper two species are removed from two large genera, in which they do not belong, for the sake of accuracy and convenience, the present names being erroneous and misleading, and the species of such economic interest as to make accurate naming desirable. A very distinctive structure, present in one of these worms, has been found to be frequently present in nematodes, but apparently overlooked or misinterpreted. It is given the name of "telamon" in this paper.

One of the species for which a new genus is necessary is *Filaria osleri* from the trachea and bronchi of the dog. This species was originally called *Strongylus canis bronchialis* by Osler in 1877, but as it has none of the distinctive characters of *Strongylus* in even the broad sense in which that term was used by the older zoologists, and as it has a trinomial name instead of a binomial name, it was renamed *Filaria osleri* by Cobbold in 1879. At the present time there are over 900 specific names and variations in the genus *Filaria*, and *F. osleri* is so remote from the type species, *F. martis* Gmelin, 1790, from the mink, that the worm ought not to be placed in the superfamily Filarioidea. I have been unable to obtain specimens of this worm for study, and the existing descriptions are unsatisfactory, but the fact that the worm has so little in common with *Filara* makes it advisable to remove it from this genus. As it does not seem to fit any existing genus, I am proposing a new genus for it, naming the genus in honor of the late Dr. William Osler, who discovered the worm and after whom the species is named. Tentatively the worm is referred to the superfamily Spiruroidea.

OSLERUS, new genus.

Generic diagnosis.—Spiruroidea: Small worms (up to 1.5 cm. long according to Rabe). Mouth structure uncertain; probably without distinct lips (according to Osler the mouth is simple and the conical

head is without papillae. Milks agrees with Neumann's description of it as having two or three prominences or concentric lips, behind which there are three papillae; according to Blumberg, the head bears several papillae; according to Rabe, the mouth is surrounded by two or three concentric folds, and near it there is one large eminence with two smaller ring-shaped ones behind it). The male has two unequal yellowish spicules. (The inequality is not very great, as is the case in species of the genus *Filaria*, since the type species of *Oslerus* has spicules 48 and 56 μ long). The posterior extremity of the male is bluntly rounded, according to Rabe; somewhat pointed, according to Osler; or somewhat pointed and slightly bent, according to Blumberg. The female has a rounded tail end and the vulva is very close to the anus (Rabe says just anterior to the anus, and Milks agrees with this; Blumberg says 20 μ anterior of the anus; and Osler says the anus and vulva open to the exterior by a cloaca, or common channel). The worms are ovoviviparous, the eggs hatching in the uterus, giving rise to embryos which are blunt anteriorly and pointed posteriorly.

The only known species occurs in the trachea and bronchi, and apparently in the pulmonary parenchyma also, of the dog.

Type species.—Filaria osleri Cobbold, 1879.

The fact that this worm is ovoviviparous would suggest an affinity with the Filarioidea. Its location in the lining of the respiratory tract and the presence of the vulva directly in front of the anus excludes it from the Filarioidea and relates it to the Spiruroidea near the Gongylonemінae, which also have the vulva close to the anus. The fact that it is ovoviviparous does not fit in well with the known members of the Spiruroidea, but as there is more or less variation in the matter of depositing eggs or bearing embryos within the limits of the larger groups, this may be regarded as a variation within the reasonable definition of the superfamily, the worm being regarded as an aberrant development.

This worm is designated as *Oslerus osleri* (Cobbold, 1879) Hall, 1921.

The other species for which a new generic name is necessary is *Strongylus rubidus* Hassall and Stiles, 1892, from the stomach of swine.

This species belongs in the superfamily Strongyloidea, but not in the genus *Strongylus*. This genus in the old extended sense contains at present over 350 specific names and variations of one sort and another, and has been restricted in its accurate meaning to forms congeneric with its type species, *Strongylus equinus* Mueller, 1784, from the large intestine of Equidae. The superfamily Strongyloidea is usually divided into the families Strongylidae, Trichostrongylidae, and Metastrongylidae. The genus *Strongylus* is the type genus of the family Strongylidae. *Strongylus rubidus* belongs in the family Trichostrongylidae. It has affinities with such genera of Tricho-

strongylidae as *Cooperia* Ransom, 1907, *Ostertagia* Ransom, 1907, and *Ornithostrongylus* Travassos, 1914, but it differs from these genera in certain respects which appear to be of generic value. The generic name *Hyostrongylus* is therefore proposed for it, with the following diagnosis:

HYOSTRONGYLUS, new genus.

Generic diagnosis.—Trichostrongylinae: Male bursa with small but distinct dorsal lobe and well-developed lateral lobes. (There is a distinct bulla just anterior of the bursa in the type species.) The latero-ventral ray is larger than the ventro-ventral ray, and its tip is turned back towards the ventro-ventral. The externo-lateral and medio-lateral rays diverge slightly, the postero-lateral ray diverging more widely from the medio-lateral. The short externo-dorsal ray arises at the base of the dorsal ray and lies about midway between the postero-lateral rays and the short dorsal ray. The dorsal ray bifurcates near its tip, and has also two small branches at about two-thirds of the distance from the base. Two equal spicules (120 μ long by 20 μ wide anteriorly in the type species), tapering to a point, with a wavy ridge running the length of the spicule and supporting a curved membranous portion, which terminates in a second point. Posterior of the position usually occupied by these spicules in the body is a narrow brown gubernaculum (60 μ long in the type species), situated in the dorsal wall of the cloaca and terminating by a colorless connection in a brown, oblong structure. Ventral of this is a structure (fig. 1), readily seen in fresh material, but so transparent as to be difficult to detect in glycerine jelly mounts or alcoholic material. This structure has a central portion shaped like a spur or a wishbone, situated in the ventral wall of the cloaca near its aperture, and with the point of the spur extending anteriorly; the two posterior points of the spur turn dorsally into the lateral walls of the cloaca and then extend anteriorly as flattened curved plates in the lateral walls of the cloaca. This structure I have named the *telamon*, a term of Greek origin used in architecture for an ornamental supporting structure. In the female worm the tail is rounded, not mucronate; the anus is very near the posterior end of the body and the vulva is about one-sixth to one-seventh of the body length from the posterior end;

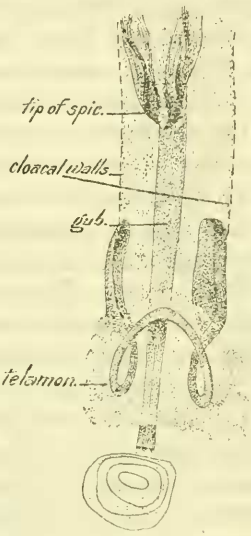

FIG. 1.—HYOSTRONGYLUS RUBIDUS. CLOACAL REGION IN MALE SHOWING TELAMON. HIGHLY MAGNIFIED.

the vulva is a long, narrow transverse slit, sometimes slightly salient. There are a very short vagina and two divergent ovejectors. Eggs are elliptical, comparatively thin-shelled, and segmenting when deposited.

The only known species occurs in the stomach of swine.

Type species.—*Strongylus rubidus* Hassall and Stiles, 1892. This worm is designated as *Hyostrongylus rubidus* (Hassall and Stiles, 1892) Hall, 1921. Travassos, in an undated reprint which has just come to hand, puts *S. rubidus* in the genus *Ostertagia*, but this species lacks the accessory bursal membrane characteristic of species of *Ostertagia*.

The type species, *Hyostrongylus rubidus*, has already been described by Hassall and Stiles (1892) in their original report on this worm, but the following point should be noted in regard to this species: In their original description, Hassall and Stiles figure the lateral portions of the telamon as filamentous. This is due to the fact that this structure is colorless and highly transparent, very difficult to find or study in alcoholic or mounted material, and they have drawn the outline and overlooked the included structure. It has been found advantageous in studying this structure to resort to staining with gentian violet. This is a very rapid, penetrating, and amenable stain, which can be used in water or any strength of alcohol, the specimens being subsequently mounted in glycerine jelly or in balsam. It clears rapidly and shows a tendency to decolorize, so it is perhaps better suited for staining material for immediate study than for permanent mounts. It stains the rays of the bursa and many of the internal organs very well, and also stains the accessory supporting structure which is designated as the telamon in such forms as *Hyostrongylus rubidus*. The so-called chitinous structures, such as the spicules, which are brown, do not take the stain, as a rule. Staining develops the fact that there is a transparent structure which connects the posterior end of the gubernaculum proper to the irregularly oval or quadrangular structure, which Hassall and Stiles regarded as the cloacal aperture, showing that these are parts of one structure. The quadrangular structure is too small to permit the passage of the spicules, even if it represented a true aperture. It is situated on the conical tip of the body, inside of the bursal cavity, and gives the tip of the body an appearance of being bifid or bicornate in profile when seen in some views. The cloacal aperture is ventral of this conical body termination and is very vague in outline, even in stained preparations.

The gubernaculum and telamon appear to be modifications of the cloacal wall, either by local thickening and condensation or by the deposition of material of suitable hardness for the protection of the cloacal walls from the passage of the sharp, pointed spicules, and for

the direction of the spicules; they also support the cloacal wall and aperture, the spicules when these are extruded, and the genital cone in some cases; a platelike gubernaculum projecting from the dorsal wall of the cloaca may also aid in separating the spicules to form a suitable channel for the passage of the spermatozoa. Apparently the term *gubernaculum* should be restricted to the more or less longitudinal structure in the dorsal wall of the cloaca toward the anterior end, and the term *telamon* used for the supporting structure of variable form near the cloacal aperture.

The study of the telamon in the genus *Hyostrongylus* naturally led to an examination of other nematodes to ascertain if this structure was commonly present. A closely related worm, *Ornithostrongylus quadriradiatus* (Stevenson, 1904), Travassos, 1914, was first considered, since *H. rubidus* and *O. quadriradiatus* were both originally described from this laboratory, the Zoological Division of the Bureau of Animal Industry, with a description and figure of a peculiar structure in the cloaca. Examination showed that the star-shaped structure (fig. 2) figured by Stevenson is a telamon corresponding in its general location and evident function with the telamon in *H. rubidus*. An examination of species of the trichostrongyle genera *Cooperia, Ostertagia, Haemonchus, Graphidium*, and *Citellinema* shows what are apparently telamons in these genera, indicating that the telamon will be found generally present in the Trichostrongylidae. What appears to be a telamon is present among the Strongylidae in the genera *Bustomum* and *Oesophagostomum*. Among the Metastrongylidae it appears likely that what has been called the unpaired accessory structure in *Synthetocaulus pulmonalis* (=*Synthetocaulus commutatus*) must be regarded as a gubernaculum, and what have been called the paired accessory structures must be regarded as the elements of a telamon. The chitinous arc in which the body terminates in the genus *Synthetocaulus* may also prove to be an element of the telamon. An examination of a number of published figures of male nematodes indicates that what is apparently a telamon has been figured by various authors, sometimes without explanatory labeling and sometimes as a gubernaculum or part of the spicules. Outside of the Strongyloidea this structure appears to be present in some form in the Oxyuroida and perhaps in the Spiruroidea and Filarioidea. It appears to be best developed in forms having comparatively short spicules and poorly developed in forms having long linear spicules, so far as I have examined them. In its simplest form the telamon seems to be a ring-shaped structure, complete or incomplete, surrounding the cloacal aperture. This elementary form is modified by the

FIG. 2.—ORNITHOSTRONGYLUS QUADRIRADIATUS. TELAMON, × 470. FROM STEVENSON, 1904.

development of processes anteriorly along the walls of the cloaca and along the sides of the genital cone. It seems probable that this relatively hard and distinct structure with its wide variation in shape will prove of value as a generic and specific character. The material of which it is composed gives the impression of being very similar to that forming the wall of the sucker in such genera as *Heterakis*, where the sucker is strongly developed. What is apparently the same material appears to be present in the region of the vulva in the female, apparently serving the same purpose as a supporting structure. This seems to be a quite distinct structure in *Trichostrongylus*, and for the time being this may be referred to as the vulvar support.